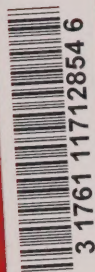


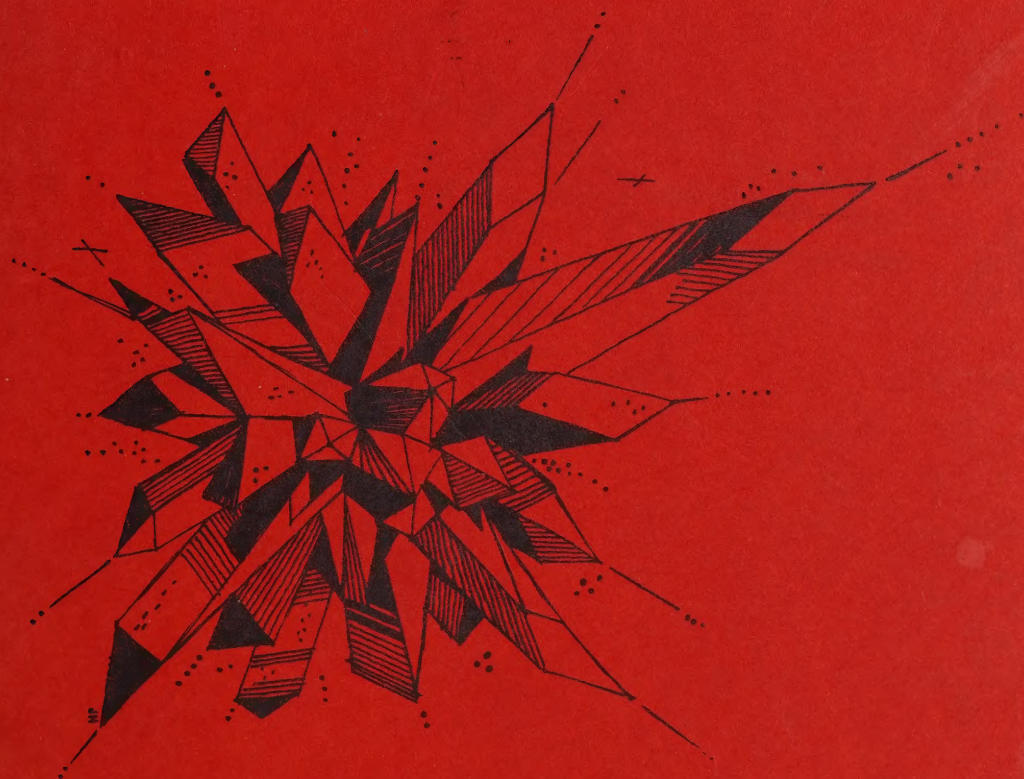
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# THE NORTHWEST TERRITORIES S E C O N O M I C P R O S P E C T S

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THE  
NORTHWEST TERRITORIES

I T S E C O N O M I C P R O S P E C T S

A BRIEF  
PRESENTED TO  
THE ROYAL COMMISSION  
ON CANADA'S ECONOMIC PROSPECTS

by

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*Commissioner of the Northwest Territories*

AT EDMONTON, ALBERTA ON NOVEMBER 22, 1955

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## PREFATORY NOTE

Canada and the Union of Soviet Socialist Republics have many things in common. Their vastness of size, their northern continental climates, their great Arctic regions, their long transportation systems—all have been remarked upon by many observers. For the future of both countries—and of millions of people outside their borders—a common feature of much greater significance is that each, almost alone in the world, has a vast undeveloped frontier region that is overwhelmingly larger than its developed area. In a world where population is rapidly increasing and where the demand for resources is growing at an awesome pace, these two countries have the greatest possibilities of tapping and developing new and untouched reserves of wealth and strength.

While little is known in detail of the efforts that are being made in the U.S.S.R. to develop the resources of its northern areas, it is clear that the Soviet Union is making great strides. The importance of northern development was already being recognized forty or fifty years ago when two railways were constructed in the northern European portion of the Soviet Union, one to Archangel and the other to Murmansk. In the second World War a lateral link of some 200 miles was constructed between these two lines. More recently the pace of exploration and development has been accelerated. A railway line of 1,100 miles from Kotlas to Salekhard—about 200 miles of which run above the Arctic Circle—has been built to open new mines near the Arctic coast in the Ural region. Over 1,000 miles of highways have been constructed in the northern part of eastern Siberia to develop a great mineral region. The river transportation systems are being developed increasingly. Northern agriculture, forestry and fisheries are the subject of intensive study. Research in the Arctic Ocean and work on the development of Arctic navigation are being pushed. New communities are appearing well above the Arctic Circle beside the large cities which have existed for a century or more. It is apparent that the Soviet Union is well aware of the importance, to its own future, of its enormous northern areas.

Canada has not done as much. This is not a reflection of discredit. Our population is much less; we have had an enormous work of development in the south; and our belief in private initiative and freedom of enterprise has caused us to refrain from the policies of government direction and control that have determined the lives and work of people in the Soviet Union. We must, however, be fully alive to the importance of our northern frontier and of the resources—many known and many as yet unknown—that lie within it. It is not necessary, nor, it is submitted, is it at all desirable, for us to wait inertly for economic forces alone to set the terms and the pace of our action. Entirely in line with sound economic progress, a great deal can be done by national policy to hasten and extend our northward development. In a region as vast as the Canadian north, with problems of distance and climate, developments cannot occur with the speed they do in smaller countries or in the southern part of Canada. If we are going to want and to need the resources of our northland in ten or twenty years, the time to begin the work of getting them is now.



The purpose of this brief is to try to forecast how the resources of the Northwest Territories may contribute to the economic strength and progress of Canada within the next 15 to 25 years and to consider what steps could be taken to assist in their development. No attempt will be made to discuss any northern problems that do not bear closely on these questions. The brief starts with a description of the natural resources of the Territories. It then discusses factors relating to their economic development, such as population, climate, transportation and defence. Finally, it suggests certain steps which can be taken to stimulate economic growth.

Statistical and other appendices are attached.



## A. NATURAL RESOURCES

### Mineral Resources

The eastern two-thirds of the mainland of the Northwest Territories and much of the Arctic islands lie in the Canadian Shield. The western boundary of the Territories—the Yukon boundary—runs along the eastern flank of the Cordilleras. Between these two rocky regions lies the Mackenzie Valley, which is a northward continuation of the Great Central Plain. The Canadian Shield is one of the great metal bearing regions of the North American continent. The Central Plains are one of the great oil bearing regions.

Because of the remoteness of the area and the difficulties of terrain and climate, prospecting and mineral exploration have been scattered and much less intensive than in the more accessible parts of Canada. Even so, the little that has been done serves to confirm the belief that these regions are as rich in minerals as their counterparts further south.

It was only at the beginning of the 1930's that a systematic geological survey of the Great Slave Lake region was begun. Using the conventional methods of those days it took several seasons to cover a sizeable area. No systematic survey of the Keewatin District—the eastern part of the mainland—was undertaken until 1952, but by this time airborne techniques had been developed to the point where it was possible to cover 57,000 square miles in a season. This survey, like the earlier ones in the Mackenzie District, revealed large areas of ground that are very favourable for prospecting. Similar airborne surveys of the northern part of Keewatin were undertaken during the 1954 and 1955 summers, and in 1955 there was an initial survey of the northernmost islands of the District of Franklin.

Prior to these surveys information on the location of rich deposits was derived from the diaries of explorers, prospectors who followed the Mackenzie route to the Yukon during the gold rush, reports of the exploratory work of members of the Geological Survey of Canada—such as Dr. Mackintosh Bell and Dr. Camsell in the Mackenzie District and Dr. Tyrrell and Dr. Weeks in Keewatin—and from the occasional findings of trappers and traders. With few exceptions these early journeys followed the main canoe routes and penetrated not at all into the interior.

The first development of any prospect destined to be of lasting importance was oil at Norman Wells, which was first produced on a commercial scale in 1920. During the War production there was greatly increased and a pipeline was built to Whitehorse. After the War the use of the pipeline was discontinued and production was limited to the amount necessary to supply the needs of the Mackenzie District.

The next major discovery was in 1930, when pitchblende was found at Port Radium on Great Bear Lake, at a site where cobalt and copper had been noted by Dr. Bell in 1900. The first radium was mined in 1933; operations were halted early in the War but were resumed a few years later for the production of uranium. No figures of uranium output are published.

Gold was discovered at Yellowknife in 1933 and rich claims were staked in 1934. There are at present three producing gold mines in the Yellowknife area, two at Yellowknife itself and one at Discovery about 50 miles to the north. Several other gold mines have been in production in the Yellowknife region for varying lengths of time. In 1939 the value of the annual output was less than \$2,000,000. By 1954 it had risen to \$10,000,000.

Much more significant than present mineral production in the Northwest Territories are the promising prospects that have reached various stages of exploration. First and foremost among these are the zinc-lead deposits at Pine Point, on the south shore of Great Slave Lake, which may develop into one of the largest zinc-lead mines on the continent. A mineralized area some 36 miles in length has been covered by 1,018 claims staked by Pine Point Mines Limited, a subsidiary of the Consolidated Mining and Smelting Company of Canada. Exploration work carried out to date has indicated an ore potential of something over 60,000,000 tons, a substantial part of which would be available by open-cut mining methods. The ore is easy to treat and the competitive position of this deposit, if adequate transportation is provided, will be extremely good.

There are several other prospects in the base metal field which, while much less spectacular than Pine Point, are of substantial importance. There is an interesting lead-zinc prospect at Indian Mountain Lake, north of McLeod Bay on the East Arm of Great Slave Lake. Exploration there has been halted because the property does not appear to be economic until better transportation facilities are available to Great Slave Lake. There are indications of similar prospects in the same area and also on the south shore of the East Arm. Further east the Geological Survey indicated a favourable mineralized belt running diagonally from Lake Athabasca to Rankin Inlet on Hudson Bay. Claims have been staked on nickel deposits at Ferguson Lake, and economic ore reserves have been developed by underground exploration at the nickel deposits near Rankin Inlet. Exploration has been in progress at a number of other points in this area. Several companies have staked claims on the deposits of iron ore in the vicinity of Kasba Lake—just north of the Manitoba-Saskatchewan boundary—which were revealed by the Geological Survey of Canada by airborne magnometer. The iron ore deposits on the Belcher Islands in Hudson Bay are being explored, and in the more northern part of the mainland, exploration is being undertaken at the copper deposits near the Dismal Lakes, in the vicinity of Coppermine.

The greatest activity in the past year has been in radio-active minerals, particularly in the Marian River region northwest of Yellowknife where several companies are undertaking intensive exploration. This area may contain substantial highgrade uranium deposits which might still prove economic even should the market for uranium, in six or seven years time, become less stable than it now is. Underground exploration is also being undertaken at a pitchblende deposit at Hottah Lake, 70 miles south of Port Radium. A second notable feature of recent exploration in the Great Slave Lake area has been the



discovery of showings of lithium. Deposits which are reported to be rich lie east of Yellowknife, and also around Snare River and in the McLeod Bay region on the East Arm.

Exploration of gold bearing deposits has slackened in recent years because costs are overtaking the price. However, improved transportation would bring down costs and further declines in the value of our dollar would improve the price. Such developments would almost certainly bring into production several properties which reached various stages of development before the decline in the gold price took place. They would stimulate renewed prospecting and exploration which could be expected to have favourable results.

Exploration for oil was carried on intensively during the War in the vicinity of Norman Wells, but when attempts to find an extension of that field failed, it ceased. A few years ago the wave of oil exploration which was moving northward in Alberta surged over the boundary into the Northwest Territories, and now exploration permits have been granted covering an area of some 19,000 square miles running down the Mackenzie Valley as far as some 50 miles north of Norman Wells. In addition there is an exploration reservation straddling the Northwest Territories-Yukon boundary westward of Fort Good Hope, of which the Northwest Territories portion covers 2,400 square miles. There are indications of oil in the northern islands of the District of Franklin. During the summer a gas well of limited extent blew in southwest of Hay River and further exploration in the area is expected to go on.

The list of these known mineral and petroleum prospects is encouraging. It is particularly so when it is realized that they have to be considered, not in relation to the vastness of the whole area, but to the extremely small part that has been travelled and examined in detail. However, it cannot be emphasized too strongly or repeated too often that the mineral resources of the Northwest Territories should be measured not by the mines and prospects that have already been found but by the geology of the region. The mineral exploration that has so far taken place is but a fraction of what would have taken place if there had been some assurance that adequate transportation facilities would be available in the event that a promising prospect turned into an economic orebody. When we recall how certain regions, previously thought to have been thoroughly prospected, and which are close to main transportation systems, have recently yielded new finds—Bathurst, Marmora and Manitouwadge are examples—there is reason for great optimism regarding such a relatively untouched region as the Northwest Territories.

## **Agriculture**

Estimates based on surveys undertaken to date indicate there may be between 1,000,000 and 1,500,000 acres of arable land in the Northwest Territories. These include some 500,000 acres of good ranchland in the Slave River basin and between 100,000 and 200,000 acres of mixed farming land in the Liard Valley. There are various sections of land which would be suitable for vegetable farming along the Hay River, and also all the way down the Mackenzie. The Department of Agriculture has maintained an



Experimental Farm at Fort Simpson since 1947. Wheat and coarse grains have ripened successfully every year with good yields. Root vegetables, tomatoes, berries and tree fruits are also grown every year. Development of new strains particularly suited to the northern conditions is proceeding. It seems unlikely that land in the Territories will be used to produce agricultural products for shipment to other parts of Canada within the next 15 to 25 years since there is likely to be enough suitable land closer to the markets. However, with the growth of population in the Mackenzie Valley and in the neighbourhood of Great Slave Lake, these arable lands can be expected to be developed for the local market. This summer the settlement of Aklavik received a shipment of potatoes from Fort Simpson. Further developments of this kind will undoubtedly take place as the region grows.

### **Forestry**

The Mackenzie District has quite a good forest cover. Towards the north the trees are small and growth is slow but in the southern portion trees often achieve a very large size. In 1955, for the first time, two large commercial timber limits have been leased in Wood Buffalo Park, which straddles the Alberta-Northwest Territories boundary. Lumber and plywood for both the northern and southern markets will be produced. As commercially desirable lumber is exploited in other parts of Canada, the timber stands in the Liard Valley and in the region around the Slave River will have increasing economic value for lumber and also for plywood and veneer. Along the Mackenzie River and in the rest of the area the main demand for lumber will likely be to meet the needs of the region itself. Sawmills have been operated for some time on the Slave River and on the upper reaches of the Mackenzie River.

### **Fishing**

A commercial fishery has been operated on Great Slave Lake since 1945 with an annual quota established by the Department of Fisheries to ensure a sustained yield. The present quota is 9,000,000 pounds a year divided seasonally into 5,700,000 pounds during the summer and 3,300,000 during the winter. In the season 1954-55, the catch amounted to 7,020,000 pounds, with a marketed value (f.o.b. Grimshaw, Alberta) of \$1,800,000. During the past summer season, the production of 4,850,000 pounds represented an increase over the previous year but is still well below the quota. The catch consists of whitefish and lake trout, almost all of which is exported to the United States, about 15 per cent as frozen fillets and most of the balance as fresh fish.

Some expansion of the fishing industry on Great Slave Lake within the next 15 or 25 years seems possible. Experience may show that a higher annual quota than 9,000,000 pounds is permissible without damaging the fishery, but 12,000,000 pounds would appear to be the most that can be expected. This would require a considerable capital expansion in boats, freighter and shore installations. The fishing industry might well be willing to undertake this if improved transportation facilities reduced fishing costs.

There are lakes close to Great Slave Lake where commercial fishing might be developed, but probably not in excess of 500,000 pounds a year. There seems little likelihood of commercial fishing for export outside the Territories developing in other waters, such as Great Bear Lake, the Mackenzie River, the Beaufort Sea, or the waters of the Arctic archipelago. The most that can be expected from these areas is a sufficient quantity to meet the needs of an expanded local population. The beluga fishery in Hudson Bay (the base for which is Churchill, Manitoba) may eventually prove capable of some expansion, but it will not achieve the status of a major industry.

## **Fur Trapping**

Fur trapping, the first industry in the Territories to produce for outside markets, has been historically the main source of income for the Indian and Eskimo population. Production, governed by biological and other natural factors, is subject to cyclical fluctuations. Prices similarly fluctuate widely since the market for furs is a world market—in which the dictates of fashion are paramount—and in which the determination of prices is largely beyond the influence of Canadian producers. Consequently, returns to trappers vary considerably from year to year. From 1946-47 to 1953-54, the total catch has ranged from a high of 922,000 pelts in 1948-49 to a low of 389,000 pelts in 1952-53. The value of production has varied from \$2,000,000 in 1950-51 to \$757,000 in 1953-54. The value in 1953-54 was the lowest in 30 years. It was only 37% of that in 1950-51. Probably no other industry, and no other group of producers in Canada, have suffered so severe a reduction in income in recent years.

The principal furs are muskrat, white fox, mink and beaver. Muskrats are the staple catch in the Mackenzie River delta and in most other districts along the river. White fox are caught chiefly by the Eskimos in the Arctic. During the past eight years muskrats have accounted for about 44 per cent and white fox for 28 per cent of the total value of fur production. Production of both species is subject to cycles, white fox having a well marked cycle of four years. In the post-war period prices of muskrats to trappers have declined from an average of \$2.75 in 1945-46 to 67 cents per pelt in 1953-54. At the same time, the catch has been decreasing and, as a result, income from muskrat trapping has declined drastically. Of all furs the long-haired furs have been most adversely affected by the vagaries of fashion during the past two decades. White fox brought an average price of \$36 in 1944-45; by 1949-50 the return to the trapper had fallen to \$6.50. In the past two years there has been some revival in the fur market, aided by promotional activities of the federal government and the trade; as a result, prices last season averaged \$10 per pelt. Similarly, muskrat prices during the current season have shown some revival. Incomes from trapping continue at a very low level, however, and there is every indication, even with temporary revival of the market, that these incomes will not be sufficient to ensure trappers an adequate livelihood.

For the long term, the outlook for fur trapping in the Northwest Territories seems limited. It is a static industry capable of little or no expansion. It is not inconceivable that the future may see some further decline brought about by developments in the fields

of low-priced synthetic fur fabrics. These may serve to reduce the demand for some types of natural furs. Mink, white fox and marten would seem to be the least vulnerable to this trend.

### **Water Power**

Hydro-electric power plants have been constructed by the Northwest Territories Power Commission at Snare River (8,350 h.p. capacity), 90 miles northwest of Yellowknife, and by the Consolidated Mining and Smelting Company at Bluefish Lake (4,700 h.p.) about 15 miles north of Yellowknife. There are a number of potential power sites of varying capacities which could be developed should any mine come into production near them. The most important site consists of two sets of rapids in the 16 mile stretch of the Slave River between Fort Fitzgerald, Alberta and Fort Smith, N.W.T. These are reported to have a potential capacity of 220,000 h.p. at Ordinary Minimum Flow and 400,000 h.p. at Ordinary Six Months Flow. Both of these rapids lie in Alberta just south of the Northwest Territories boundary. It seems likely that power would be developed here if at some future time it should be decided to build an electrolytic zinc smelter at Pine Point. Another potentially large site is on the Lockhart River at the east end of Great Slave Lake, with a reported capacity of 100,000 h.p. at Ordinary Minimum Flow and 150,000 h.p. at Ordinary Six Months Flow. This site is remote from any present mines and its development would depend upon the discovery of large economic deposits in its vicinity.



## **B. OTHER FACTORS RELATING TO ECONOMIC DEVELOPMENT**

### **Population**

In the 20 years from 1911 to 1931 the population of the Northwest Territories rose from 6,507 to 9,316—an increase of 2,809 or 43 per cent. During the following 20 years from 1931 to 1951, when the mineral developments were taking place, the population rose from 9,316 to 16,004, an increase of 6,688 or 72 per cent. During this 20 years the white population of the Mackenzie District rose from 867 to 4,915, an increase of 467 per cent.

To a large extent the future population of the Northwest Territories will be determined by its economic growth. However, there is one segment of the population on whose problems future economic growth will have a vital influence, and that is the Indians, Eskimos and others who live in the small settlements and now depend for their livelihood largely on hunting, trapping and fishing. The problems of these communities are both sociological and economic. Their economy is precarious and, until development takes place, will remain so. With modern health services, family allowances, and other benefits, the population is growing. The old means of livelihood are becoming less and less adequate for a steadily larger number of people. One of the most satisfactory solutions to this problem will be to fit these people into wage earning activities in an expanding economy. Before this can be achieved two things have to take place: the native people have to be better fitted than they now are to undertake these activities and the necessary wage earning jobs must be available.

### **The Problems of the Native People**

In 1951 there were 3,800 Indians and 6,900 Eskimos in the Northwest Territories. The entire Indian population and 1,500 Eskimos lived in the District of Mackenzie. The remaining Eskimos are in Keewatin and Franklin. The Eskimo population is surprisingly youthful, with 65 per cent under 25 years of age. It is increasing at a rate which, under the present health and welfare programs, is likely to be maintained or even accelerated. It seems probable that by 1961 the Eskimo population will number about 8,500. The Indian population is also youthful; 56 per cent are under 25 years of age. Some increase is taking place although not at as rapid a rate as for the Eskimos.

*Indians.* Fur trapping, hunting and fishing continue to provide the means of livelihood for the greater number of the Indian and half-breed people. Of these occupations, only trapping provides them with a cash income. During the past few years, however, world fur prices have fallen drastically. In many areas of the Mackenzie River valley and delta catches of some animals have gone down and this has aggravated the situation. At the same time the limited registered trapline areas available are not capable of supporting the growing population. In the District of Mackenzie there are about 1,700 people (1,500 of whom are natives) who are licensed to hunt and trap; not all are full-time trappers but

most trap to a varying degree. As their income from furs has declined—from \$1·4 million in 1950-51 to \$455,000 in 1953-54—the income per trapper has shown a similar reduction.

Hunting of game—largely caribou and moose—is a major source of food and clothing for Indians and Eskimos and of food for their dogs. In recent years it has become increasingly more difficult to obtain food and clothing from the resources of the country. The most serious decline in game animals appears in the number of barren ground caribou which are by far the most important source of food and clothing. A survey in 1948-49 placed the population at about 668,000; a re-survey in 1955 showed a drastic fall to an estimated 300,000 animals. The importance of this can hardly be over-stated. Many of the Indian and Eskimo people are almost entirely dependent on the caribou for their livelihood. If the number has diminished as the surveys indicate, a drastic change in the economy of several thousand people has to be effected within the next few years.

Fishing, the other traditional source of food, is carried on locally in most lakes and rivers. While there are variations in the catch, these domestic fisheries appear reasonably adequate to meet future requirements.

The hardship caused the native population by the depressed state of fur trapping and the decline in the caribou has made it necessary for the Federal and Territorial governments to spend substantial sums on direct relief. Relief expenditures by both governments have totalled \$666,000 during the period 1946-47 to 1954-55, increasing from \$17,000 in 1946-47 to \$155,000 in 1954-55. Relief to Indians has amounted to \$272,000 or 41 per cent of the total expenditure while relief for indigent whites and half-breeds has totalled \$53,000. The most serious aspect of this is not the cost. It is the demoralizing effect of dependence on relief. For a people who are not adjusted to our attitudes and ways of life the consequences may be disastrous and permanent.

In common with other Canadians the native people are receiving improved and increasingly effective health and welfare services, family allowances for the children and other social security payments for the aged, blind and disabled. These social benefits have improved the lot of many of them. Old age security payments, old age assistance and blind persons allowances to Indians in the Northwest Territories currently amount to about \$100,000 annually and may be expected to increase as difficulties in determining eligibility are overcome.

New opportunities for employment are becoming available only gradually. In the meantime the Indian Affairs Branch of the Department of Citizenship and Immigration, in co-operation with other departments, is attempting to introduce some stability into the traditional Indian economy and to supplement present means of livelihood. Game conservation and management measures have been implemented, assistance has been given through provision of fishing nets and boats, refrigeration facilities have been constructed, gardening projects have been encouraged and assistance given in construction of houses.

The long-term solution, however, lies in provision of alternative and supplementary livelihoods. This is a complex task. It necessitates initially the provision of extended education and vocational training facilities to enable young natives to prepare themselves for

wider employment opportunities. As these opportunities in existing and new industries become more widespread, and as educated and trained young people become available, those who wish to enter wage employment should be able to do so in skilled and semi-skilled trades.

At present some Indians are employed as unskilled labourers, largely during the summer months, with government departments and agencies, at the trading posts, as stevedores, at the oil refinery at Norman Wells, with the fishing companies on Great Slave Lake, and in construction work. Their adaptation to steady employment and stability of residence is in its early stages. The process of adjustment to and integration into our industrial economy can be effected only over a period of years but it must move forward more rapidly than in the past. For economic and social reasons the need is imperative and immediate.

*Eskimos.* Although engaged in the same activities—trapping, hunting and fishing—as the northern Indians, the Eskimos are faced with a number of special problems. They inhabit the Arctic regions which generally do not appear to offer as immediate a prospect for economic development as does the Mackenzie River Valley. In addition, it is only since the Second World War that the Canadian Arctic has become more accessible and the encroachment by our industrial society on the Eskimo culture is still in process. As a result, the Eskimo mode of life is in transition.

The present Eskimo economy is precarious. For years cash income in most areas has come almost entirely from white fox and, in the Mackenzie River delta, from muskrat, with their cyclic populations and widely fluctuating prices. In many places game—notably the barren ground caribou—is declining and the resources do not adequately and reliably support the growing population. Marine resources of the Western and Eastern Arctic are utilized by the Eskimos for food, fuel, clothing and shelter. The possibilities of establishing commercial fisheries appear unlikely.

The depressed condition of the Eskimo economy and extension of medical, hospital, welfare and rehabilitation services have necessitated a rapid rise in relief payments by the federal government in the past few years. Relief to Eskimos has increased from \$5,000 in 1946-47 to \$94,000 in 1954-55, for a total of \$342,000 for the period. Social security payments have provided a new and important source of income: family allowances amounted to \$283,000 in 1954-55 while \$23,000 were paid for old age security pensions, old age assistance and blind persons allowances.

Relief and welfare payments, however, do not meet the much broader needs of health, education and a sound economy. Each of these is related to the other. A sound economy means a diversified economy not based on white fox trapping alone; new occupations are needed, but if the Eskimos are to undertake these occupations satisfactorily they require better health and education.

Some of the new means of broadening the economy need not significantly affect the traditional way of life, and may indeed capitalize on its skills. The federal Department of Northern Affairs and National Resources recently established an Eskimo Loan Fund



to assist individuals or groups in carrying out approved projects for the improvement of their economy. Stone carvings and other handicrafts are bringing a new source of income—at least an estimated \$25,000 in 1953-54—to Eskimos in many areas in the Eastern Arctic. Boat building projects have been successfully sponsored at Lake Harbour on Baffin Island and at Tuktoyaktuk where a number of Eskimos are being trained. Some families have been transferred and others encouraged to move to areas where game and fur resources are more ample. Other possibilities for providing supplementary means of livelihood are being examined, such as animal and poultry husbandry and vegetable gardening and the collection and marketing of eiderdown in certain areas. At the Reindeer Grazing Reserve near the mouth of the Mackenzie River, where reindeer were introduced in 1935, four of the five herds were recently turned over to Eskimo management, and the experiment in training the Eskimos in reindeer herding is being continued.

Employment of Eskimos for wages on a continuing basis, however, involves a complete break with their traditional way of life. Already Eskimos are working for government departments and other agencies, at defence installations such as the military bases at Churchill and Frobisher Bay, for mining companies at Ungava Bay and Rankin Inlet, and as stevedores. Within recent months quite a large number have been employed in construction of the Distant Early Warning line. The great majority have become adjusted to regular employment and are proving satisfactory. Examination is now being made of the possibility of employing a number of Eskimos permanently on the DEW line when it is in operation. Similarly Eskimos who have received training in carpentry and other trades are being employed at the new site of Aklavik. Not only do these various projects provide Eskimos with opportunities for gainful employment but they enable them—through their knowledge of the north—to make an important contribution to its development.

Earlier this year the federal government initiated an extensive program for construction of schools and hostels to provide grade school, advanced general education and specialized vocational training for children in the Northwest Territories. Day schools, vocational training schools and hostels are to be constructed over a six-year period. At first they will be located mainly in the Mackenzie River valley, where the need is most urgent, but later they will be extended throughout the Arctic region. The program is designed to prepare Indian and Eskimo children to meet changing conditions in the north and to enable them to enter the new types of employment as they become available.

### **Economic Development and the Human Problem**

The human problem in the north lends a note of urgency to the need for economic development. The deposits of zinc or nickel that are not mined this year or next will be the same in ten or twenty years. The people whose economy is now disintegrating will not. A people who have been accustomed to supporting themselves by hard effort in a rigorous existence can be adjusted to a new way of life—to wage employment in mines or construction work, to lumbering or to other activities—if their self-reliance is not undermined. But if a generation becomes increasingly dependent on relief—if the

idea becomes established that work is not necessary because the government will provide—the moral fibre of a people may be sapped. Their capacity for self-reliance and for constructive work may be permanently diminished.

The people of the north—the Indians and the Eskimos—are used to the country and its climate. With proper training and adjustment they can contribute greatly to the development of northern Canada in the years to come. But many will not be there to aid in that development if it does not occur sufficiently soon or at a sufficiently rapid pace to provide the economic means of life for them. And those who are there may be less able to participate if, over a period of years, they have become accustomed to reliance on relief.

The human problems of today and the economic development of tomorrow are inextricably intertwined in the Northwest Territories.

### **Climate**

In considering the possibilities of economic development in the Northwest Territories many people are apt to assume that the climate is a major factor—if not a complete obstacle—in the way. For that reason it is important to examine the climate and its implications.

About half of the mainland area of the Northwest Territories and all of the islands in the archipelago lie in the Arctic, the remainder being sub-Arctic. The geographer's definition of the Arctic, however, varies from the popular conception that it is the land lying north of the Arctic Circle. The Circle merely designates the portion of the earth north of which the sun does not set for one or more days during the summer and does not rise for one or more days during the winter. It has no geographic or climatic significance. The generally accepted geographical definition of the Arctic is the area in which the average mean daily temperature of the warmest month of the year does not exceed 50°F. In general, the line that bounds this area in Canada corresponds with the Tree Line. On the western side of the Territories the Tree Line runs close to the Arctic Coast but in the vicinity of Coppermine it starts to slant southeast, finally crossing the Manitoba border and running just below Fort Churchill. Everything north of that line is "the Arctic" in a geographic and climatic sense.

The winters in the sub-Arctic region of the Mackenzie Valley are longer and colder than in southern Canada but the summers, while short, are pleasantly warm. In the Arctic the summers are cooler. Perhaps the most illuminating basis for comparing the winter and summer is the average mean daily temperature during the five coldest months of the year and the three warmest months. In Yellowknife, which is the centre of present mining activity and is typical of some of the most promising potential areas, the average daily temperature from November to March inclusive is -8° F. The comparable temperature in Edmonton is 16° F., in Saskatoon 10° F., in Winnipeg 9° F., in Sudbury,

18° F., and in Chibougamau 8° F. An average difference of 17 degrees, day in and day out for five months, which is the difference between Yellowknife and Winnipeg, is very considerable.

Now to compare the summers: the average temperature in Yellowknife during June, July and August is 57° F. In Edmonton it is 60° F., in Saskatoon 62° F., in Winnipeg 64° F., in Sudbury 64° F., and in Chibougamau 58° F. Therefore the average daily difference in the three summer months between Yellowknife and Winnipeg is only seven degrees.

What are the economic consequences of the climate of the Northwest Territories? One obvious effect of the cold winters is to increase the cost of heating quite substantially. A rough measurement of this is provided by data on annual total "degree-days" of heating requirement. By definition, the basic point is 65° F., which is considered to be the daily mean temperature below which heating is required. There are as many "degree-days" as there are Fahrenheit degrees difference in temperature between 65 degrees and the mean temperature for any day when the mean is below 65 degrees. The average degree-days of heating required in Yellowknife each year is 15,600. At Edmonton the number is 10,300, at Saskatoon 10,800, at Winnipeg 11,000, at Sudbury 9,500 and at Chibougamau 12,400. In other words, the amount of heating required per year is about 50 per cent more in Yellowknife than in Edmonton or Saskatoon. In this sense the climate raises the cost of living and the cost of operating a mine or plant.

The shorter summers are a handicap to the growth of some plants, but not by any means of all. In much of the Mackenzie Valley the shorter growing season is to a large extent offset by the long hours of daylight. The total hours of daylight at Fort Simpson during the vegetative period are only about 11 per cent fewer than at Lacombe in central Alberta. Another limiting factor in plant growth is the dry nature of the climate. Total rainfall during the vegetative period is about 7 inches at Fort Simpson compared with 13 inches at Lacombe. Here again, however, there is an offsetting factor inasmuch as, with the long hours of daylight, there appears to be a more effective use of moisture in the north. Further, permafrost, where it occurs, generally in the area north of Fort Simpson, while it is a hindrance by keeping the soil cool, does serve a useful purpose in helping to retain moisture close to the surface. The consequence of all these factors is that, in those areas where the soils are suitable for agriculture, the production of coarse grains, vegetables, feed crops and hay is not only possible but often attended by outstanding success in latitudes where most Canadians are likely to think of agriculture and gardening as quite impossible. The arable land of the Northwest Territories is almost entirely within the region where summer temperatures make normal plant production of adapted crops entirely feasible.

The greatest prospects of most of the Territories are, however, not in agriculture but in mining. For mining operations the climate is a cost factor but it is not a physical barrier. It does not prevent mining or construction activities, or transportation by aircraft, truck or tractor train. Neither does it prevent the establishment of living conditions just as comfortable as in other parts of Canada. Mines have been operating successfully for



many years at Yellowknife and Port Radium. Both of these places are within the sub-Arctic region, but mining in the Arctic would be just as feasible. The construction of the Distant Early Warning line is demonstrating beyond any doubt that, within the furthest reaches of the Arctic, operations involving a great deal of outdoor work can be carried on quite successfully, by men and machines alike, at all seasons of the year.

What the long and cold winters do, however, is to cause a substantial increase in the cost of living and carrying on any kind of occupation, whether indoors or out. They add substantially to the cost of heating and the cost of construction, they necessitate proper clothing, and they limit the transportation season when transportation—as so often is the case—is dependent on water. In a number of ways, therefore, the climate is a factor contributing to higher costs, but, it must be emphasized, it is not a physical obstacle to the development of the resources of the Northwest Territories.

## **Transportation**

The most difficult and urgent problem to be faced in the economic development of the Northwest Territories is transportation. In part the problem is one of distance, the long distance which the mining centres and other settlements in the Territories are from their markets and sources of supply. Edmonton—the “jumping off” place for the Mackenzie District—is some 2,000 miles by rail from the markets and manufacturing centres of eastern Canada and the eastern United States. Yellowknife, by rail and water, is another 886 miles from Edmonton; Port Radium is 1,660 miles from Edmonton and Aklavik is 1,898 miles. Distance in transportation means increased cost. However, another and most significant aspect of the transportation problem derives directly from the inherent nature of the Northwest Territories as a pioneer region. The long distance between settlements and the sparse population make traffic density very low, and this in turn makes any form of transportation expensive. It tends to discourage the provision of adequate services.

The high transportation costs affect enterprises in the Territories in several ways. They are a direct burden on the expense of bringing in equipment and operating supplies and of shipping out concentrates and other products. They are also an indirect burden because the higher costs of living, due in substantial part to the costs of transportation, make it necessary to pay more for labour in one form or another, whether by higher wages or by subsidized board and lodging or free transportation or other benefits. In addition, the short navigation season requires the keeping of high inventories, which is a costly process. The slowness and infrequency of river transport may cause loss of production time through delays in getting necessary spare parts or equipment. All these costs taken together represent a formidable total. As a result, any program designed to stimulate the economic development of the Territories must begin with a determined attack on the problem of transportation.

The cheapest—and therefore the traditional—form of transportation in a pioneer country is by water. In the Northwest Territories this has principally meant the Mackenzie River system. The difficulty there is that the river system flows through a climate that

is cold a good part of the year. It is closed to navigation for eight or nine months out of the twelve. Such a limitation on its utility goes far to offset its cheapness. The nearest railheads serving the water routes of the Mackenzie District are at Waterways and Grimshaw in Alberta. They are served by the Northern Alberta Railways which is jointly owned by the Canadian National Railways and the Canadian Pacific Railway. From Waterways there is a service by tug and barge down the Athabasca and Slave Rivers to Great Slave Lake, and across the lake to Yellowknife or down the Mackenzie River to Tuktoyaktuk on the Arctic Ocean. This river route is interrupted by a series of rapids on the Slave River covering a 16-mile stretch between Fort Fitzgerald, Alberta and Fort Smith, N.W.T., around which all goods must be carried by truck—a process which, in itself, adds a great deal to the transportation cost.

In addition to this portage, another obstacle is the very shallow water, particularly during the latter part of the summer, where the Athabasca River runs into Lake Athabasca. The problems involved in navigating this stretch are intensified by the fact that the channel shifts frequently and therefore cannot be charted. During low water years, which occur frequently, this stretch of water can seriously interfere with freight deliveries. It may prevent the movement into the Northwest Territories of some of the freight received at Waterways in what would normally be plenty of time before the closing of navigation.

The navigation season from Waterways is short. The first tug and barge left Waterways for Yellowknife this year in mid-May. The Northern Transportation Company announced that its final dates for receiving goods for shipment from Waterways are August 11 for points north of Norman Wells, August 18 for Hay River and posts on the Mackenzie and Great Bear Lake south of Norman Wells, and September 15 for Yellowknife.

Adequate statistics for traffic on this route are not available. It appears, however, that in 1954 about 32,000 tons of freight moved into and out of the Northwest Territories through Fort Smith. At the moment no breakdown on northbound and southbound traffic is available but indications are that as much as 27,000 tons may have been northbound. During the past transportation season there was a considerable increase in traffic to the Arctic coast owing to the construction of the DEW line stations. Much of this increased traffic will, of course, disappear when the stations are completed, but there will be a considerable permanent increase due to operational supplies and to general development in the Territories.

From the railhead at Grimshaw the second transportation route begins. The Mackenzie Highway runs 381 miles to the settlement of Hay River on Great Slave Lake. This highway was completed in 1949. The federal government bore the whole of the cost of the Northwest Territories section and two-thirds of the cost of the Alberta section. The federal government maintains the highway in the Northwest Territories and the Alberta government maintains it in the province.

From Hay River there is a tug and barge service across the lake to Yellowknife and down the Mackenzie as far as Tuktoyaktuk. Because of the higher cost of shipping goods by truck on the Mackenzie Highway, however, relatively little freight moves to or from

Yellowknife or to or from Mackenzie River posts by this route. There is some movement of cars to and from Yellowknife and some fresh fruits, vegetables and meat go in. Also, since navigation closes somewhat later from Hay River than from Waterways, there may be a movement of late freight during the latter part of September and early October. The main southbound traffic on the Mackenzie Highway consists of fish from Great Slave Lake. An important northbound movement over the highway, this year and in the future, will be alkalyte consigned principally to Norman Wells, but also to Hay River and Yellowknife, to meet the increased demand for aviation gasoline for DEW line purposes.

Much has been done by air transportation to open up and service the Northwest Territories. Scheduled air flights operate from Edmonton to Fort Smith and Yellowknife, down the Mackenzie River to Aklavik, and north from Yellowknife to Port Radium and Coppermine. With the exception of movements by bus and automobile over the Mackenzie Highway to Hay River, all passenger traffic in the Northwest Territories goes by air. A good deal of express and freight moves in the same way. Perhaps, however, the greatest contribution of the aircraft to northern development has been the opening up of remote areas to prospectors. The presence of innumerable lakes in the Canadian Shield makes it possible for aircraft with floats in summer and skis in winter to take parties into almost any part of this region and to bring them the supplies and light equipment they need. The only limitation on this kind of flying is for one to two months during the freeze-up and during the breakup, when landing on water is impossible. Chartered aircraft companies operate out of Fort Smith, Yellowknife, Hay River and Aklavik in the Mackenzie District, and they serve the eastern Arctic from bases in northern Saskatchewan, Manitoba, Ontario and Quebec.

In the District of Keewatin no surface transportation routes exist, and all freight movements must be by coastal vessel or air. Coastal vessels also serve the islands in the archipelago. The ships of the Hudson's Bay Company operate a common carrier service, and other freight movements are by chartered vessel.

### **The Distribution of Governmental Responsibilities**

It may be helpful to give a very brief note on the government of the Northwest Territories and the division of responsibilities between the federal government and the territorial government.

The territorial legislative body is the Council of the Northwest Territories. It consists of nine members, five appointed by the Governor-in-Council and four elected by the residents of four constituencies in the Mackenzie District. The administration of the Territories is the responsibility of the Commissioner, who acts under instructions from time to time given to him by the Minister of Northern Affairs and National Resources or the Governor-in-Council. Generally speaking, the responsibilities of the territorial government are the same as those of a provincial government, except that the Territories do not have the power to borrow money and do not administer their natural resources.



In retaining control over natural resources, except wildlife, in the Crown in right of Canada the same practice has been followed as with the prairie provinces until 1930. During the time when the financial resources of a frontier territory are slender it is in the best interests of economic development that the control over resources, and the contingent responsibility for developing them, should be in the hands of the federal government. It has been fully recognized by that government, however, that in exercising control over the resources of the Northwest Territories it does so as trustee for the people of the Territories, present and future, in the same way that the federal government of the day administered the resources of the prairie provinces. It is for that reason that the Council of the Northwest Territories has felt free from time to time to suggest to the Government of Canada proposals for natural resource development which they feel to be in the interest of the Northwest Territories, and it is in the same spirit that a discussion of this subject is included in this brief.

## C. WAYS AND MEANS OF ENCOURAGING ECONOMIC DEVELOPMENT

The foregoing description of the resources of the Northwest Territories and related matters has shown that the most important natural resource is minerals—metals and oil. There is every reason to believe that the store of these resources is sufficiently great that the Northwest Territories will play a major role in supplying world demand in the future. Other resources exist in the Territories—agricultural land, forests, fish, water-power—but to a large extent the development of these, other than perhaps forestry and fishing, will depend upon the growth of local population and local industry. The great resource which will produce this growth will be minerals.

The greatest obstacle to the present development of the mineral resources of the Northwest Territories is the high cost of operation. This cost derives from a number of factors, some of them being the direct result of climate. The most important element, however, is a whole set of high costs due, directly and indirectly, to problems of transportation. These costs can all be brought down substantially. Nothing else will have so great an effect in stimulating economic development.

Before discussing how the costs of transportation can be brought down, the first question to be decided is whether it is desirable, at this stage of Canada's economic development, to introduce any special measures to stimulate economic development in the north. It could be argued that the development of the mineral resources of the country should be determined entirely by the current supply and demand position of the resources in question. If a zinc-lead deposit is found in a region which is so remote that it does not pay the mining company or the railroad company to build a railroad to the deposit, the normal contention would be that the deposits should be allowed to stay in the ground until other mines are used up and it becomes profitable to build a railroad. The same line of reasoning could be applied to the economic development of the north generally.

This line of argument might have considerable validity but for three facts. The first is that it is exploration as well as production which requires the stimulus of adequate transportation facilities. The second is that there is often a gap of between five and ten years between the time when a promising mineral deposit is discovered and when a mine can be brought fully into production—and in the north it is usually closer to ten years than five. This means that it is desirable to stimulate exploration approximately ten years ahead of the time when it is believed that the production from a region will be required. If nothing is done until the demand exceeds the known supplies, then additional supplies in the remote area will not have been discovered and will not be ready to come into production. Consequently, for a period of five or ten years prices of certain vital raw materials will be substantially higher than would have been necessary if a more far-sighted policy had been adopted.

The third fact is one I have already mentioned—the social and economic situation of the native people in the Northwest Territories which cannot wait. Either there is

development in a few years to provide a broader economic base for the people there, or a major human problem must be faced—and the problem itself would have serious consequences upon our northern development at a later date.

It is for this Royal Commission rather than for me to say whether the latent mineral resources of the Northwest Territories are likely to be required in large quantities ten years hence. It is not inappropriate, however, for me to advance my views and those of the Administration which I represent. The findings of the Paley Report estimated that between 1950 and 1975 there would be a steady and tremendous increase in the world demand for the great majority of metals. It is possible, of course, as methods of prospecting and exploration improve, that all types of minerals will ultimately be found in sufficient supply in regions which are less remote than the Northwest Territories. That this will happen, however, is highly improbable. Therefore, it appears to me that if we fail to take early steps to stimulate active mineral exploration in the remote areas of Canada we shall be courting the danger of shortages and higher prices a decade hence and we shall fail to put ourselves in a position to take maximum advantage at that time of the resources of the north.

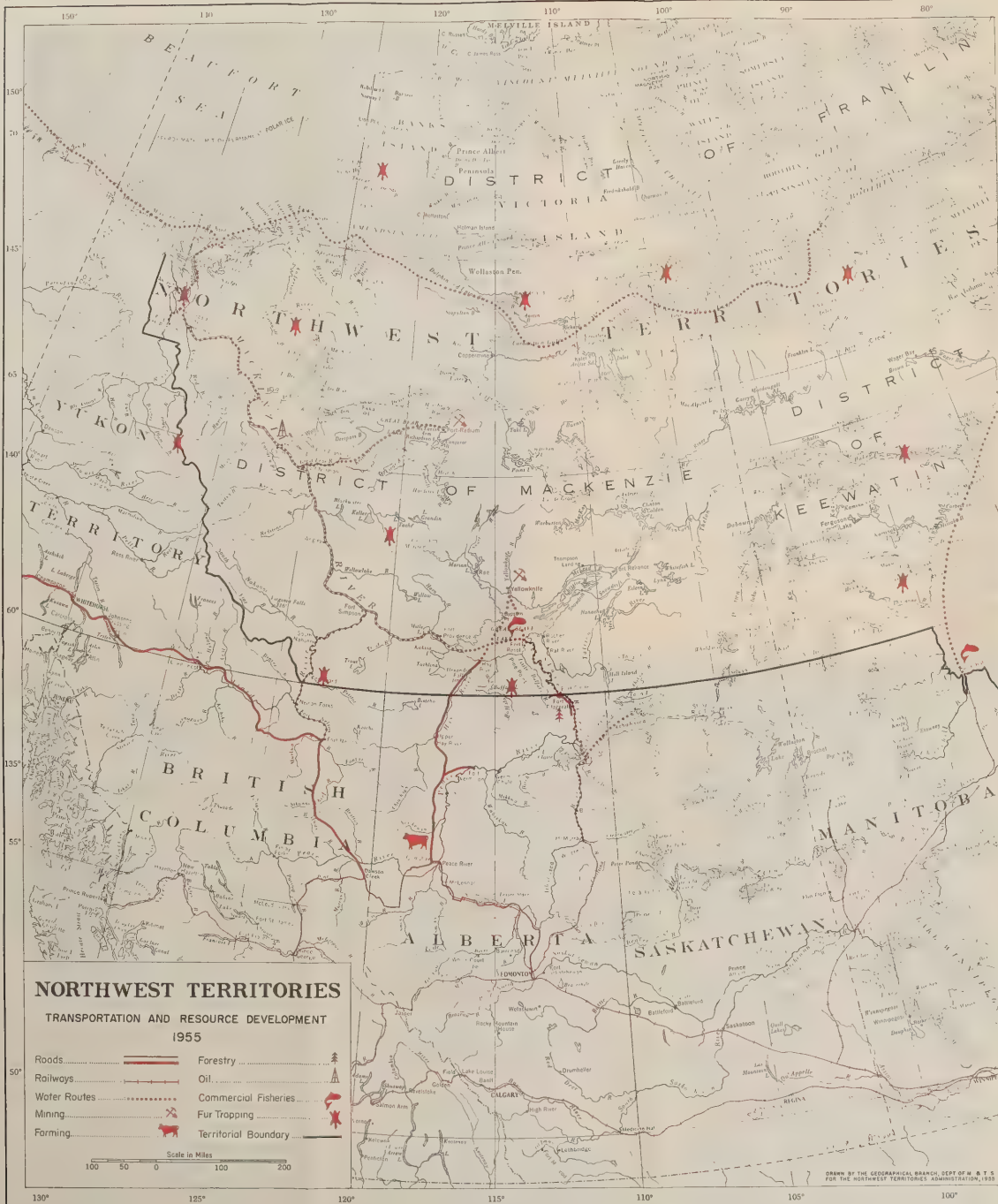
May I submit for the consideration of the Commission three methods by which transportation facilities into the Northwest Territories might be improved. The first is the construction of a railroad to Great Slave Lake. The second is construction of roads into promising resource development areas when and as indications suggest that these areas, given highway transportation, would be economic to develop. The third is the adoption of the policy of supplying the newly constructed defence stations in the Northwest Territories by commercial air services and the establishment of a network of scheduled commercial airlines in the Arctic.

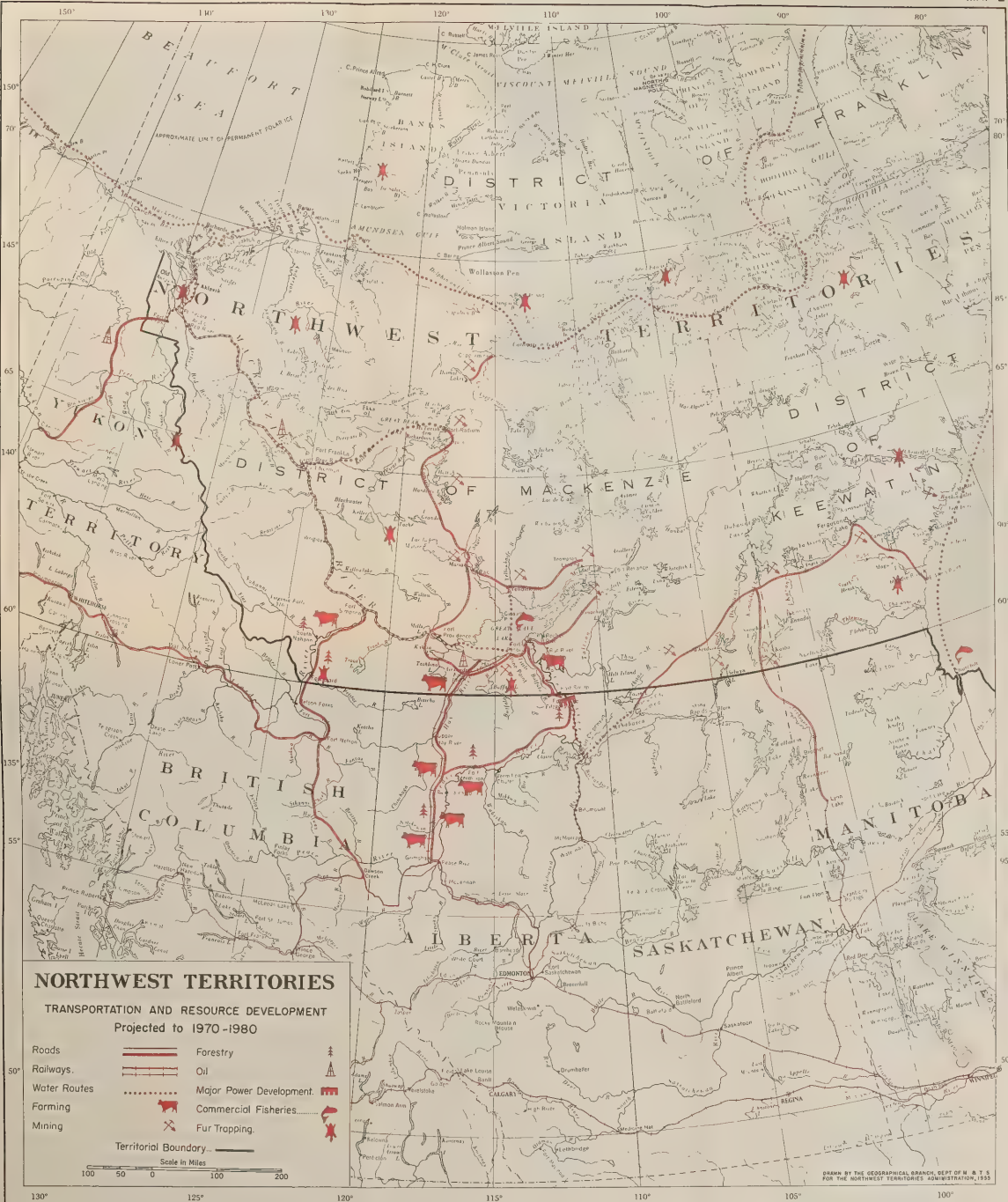
### **A Railroad to Great Slave Lake**

A railhead on Great Slave Lake, some 400 miles further north than the present railheads, would have profound effects on the economic development of the whole Mackenzie District. In the first place it would mean lower freight rates. It is difficult to estimate exactly how much the reduction would be, partly because goods carried by rail are divided into a number of classes for freight rate purposes whereas on the water route this division is less rigid. However, studies undertaken by the Administration of the Northwest Territories indicate that with a railroad to Great Slave Lake the cost of carrying general merchandise from Edmonton to Yellowknife would be from 25 to 30 per cent less than the present cost of carrying these goods by rail to Waterways and then by barge. The proportionate reduction in freight rates would become progressively less to points down the Mackenzie River, but it would still be substantial. The rate from Edmonton to Norman Wells would be about 15 per cent less than the present rate. The rate from Edmonton to Aklavik would be about 12 per cent less. On high transportation costs reductions of this magnitude would be important, in their effect both on general living costs and also on the cost of starting new enterprises.













I cannot make any estimate of the saving on a southbound movement of concentrates because neither of the transportation companies operating on the river publishes any special rate for this class of goods. Such concentrates as are carried move at the class rate for general merchandise. However, if a base metal mine should come into production, for example, on the East Arm of Great Slave Lake, it seems likely that a special rate for concentrates would be introduced.

Another sphere in which the freight rate reductions would be highly significant would be in the cost of shipping fish from Great Slave Lake to the United States. With a railhead on Great Slave Lake the through rate for fish from the Lake to Chicago could probably be reduced by about 25 per cent. This would be the equivalent of two cents a pound, or about 12 per cent of the present landed cost of the fish at Hay River. A reduction of this magnitude might be sufficient to encourage the fishing industry to come closer to the present quota and to undertake the necessary capital expenditures to expand production if an increase in the quota were considered permissible.

A railhead on Great Slave Lake would have other advantages. At the present time all-year round transportation to the lake is provided by the Mackenzie Highway, and the freight rate from Edmonton to Hay River is approximately \$50 a ton. The rate from Edmonton to the lake by rail would, on the basis of present representative rates, be about \$32 a ton. The head of navigation would then be placed on the lake and would be some 500 miles further down the river system than it now is. As a result, the time involved in a round-trip from railhead to the mouth of the Mackenzie would be substantially reduced and the amount of freight which could be carried down the river by the existing equipment would be proportionately increased.

Another and important advantage would be that a railhead at Pine Point would increase the capacity of the Waterways-Great Slave Lake route to handle a greater volume of traffic. A number of factors, in particular the congestion of traffic over the portage at Fort Smith and the bottleneck at the mouth of the Athabasca River, make the present water route from Waterways to Great Slave Lake quite inadequate to handle a heavy volume of concentrates such as might be produced if base metal mines were to be developed. In fact, because 1955 happened to be a low water year, the freight required for the DEW line and for increased exploration in the Great Slave Lake area, coming on top of the normal requirements of the region and growth in the Lake Athabasca area, caused a serious dislocation of traffic this year. At one time there was some anxiety that some of the freight might not be delivered this season.

Mining developments on Lake Athabasca in Saskatchewan are steadily growing and the freight requirements of the mines there, and of the community of Uranium City, are becoming very great. The Northern Transportation Company is reported to have estimated its total 1955 freight movement at 125,000 tons—25,000 tons more than in 1954. The Company estimates that the 1956 movement will be greater, and 1957 greater still. The congestion at Waterways, and the problem of low water on the Athabasca River, have caused concern this year. The river system between Waterways and Lake Athabasca will become progressively less adequate as development continues. The construction of

a railway to Great Slave Lake would relieve the situation. Virtually the entire freight for the area of that lake and the Mackenzie Valley would then move over the railway line. The water system of the Athabasca River would be left with the requirements of the Lake Athabasca and Slave River areas only.

The improvements in transportation costs and facilities that would result from a railway would undoubtedly stimulate a considerable amount of immediate economic activity. They might result in the lead-zinc deposit on the East Arm of Great Slave Lake coming into production, and they might have a similar effect on a number of the uranium and lithium finds. Further, as I have already indicated, the fact that transportation would be available to handle any substantial deposit which might be proved up would stimulate the exploration of a number of regions which are now known to be promising.

Furthermore, a railway to Great Slave Lake would also materially benefit agriculture and forestry in the Province of Alberta. Good farming and forest lands exist for the first 180 miles of the proposed railway, north of Grimshaw and eastward to Fort Vermilion. This region is already served by the Mackenzie Highway but there is no doubt that the lower freight rates which would be provided by a railroad would greatly stimulate development. An agricultural authority has expressed the opinion that, with a railway, the potential grain shipments from the Fort Vermilion area could easily reach 30 million bushels a year.

Even with all the benefits that would be produced by a railroad to Great Slave Lake, however, it would be impractical to construct it unless a substantial volume of freight would immediately be available to cover at least a large part of the operating costs. The management of the Northern Alberta Railways have indicated that a railroad from Grimshaw to Great Slave Lake, in the vicinity of Pine Point, would probably cost between \$50,000,000 and \$55,000,000. They have stated that if the capital cost were to be borne by the Northern Alberta Railways, and if it is assumed that the outbound traffic would consist of concentrates, then—after taking into account the inbound movement of mining supplies, and crediting to the movement the feeder value of the branch line to the N.A.R.—the outbound traffic of concentrates, using representative freight rates, would need to amount to 800,000 tons to provide for interest, maintenance and operating expenses. They added that if the line were constructed at Government expense and turned over to the Northern Alberta Railways free of interest charges, the outbound tonnage of concentrates required to meet maintenance and operating expenses would be about 350,000 tons a year.

Fortunately it seems that the potential zinc-lead mine at Pine Point would provide a substantial southbound traffic, though probably not sufficient—in the first instance—to cover all of the operating and maintenance costs. The Consolidated Mining and Smelting Company of Canada have indicated that Pine Point Mines Limited is prepared to start production at the rate of 1,000 tons of ore a day, provided that a railway is constructed to Pine Point, and that this would be increased within a year or two to 2,000 tons of ore a day. Ultimately the production from Pine Point would be in the order of 10,000 tons a day, but there is no indication as to when this last stage would be reached. The rate of 1,000 tons of ore a day would produce concentrates of 225



tons and the rate of 2,000 tons of ore would produce concentrates of 450 tons, or 157,000 tons a year. This traffic therefore, would provide about 45 per cent of the minimum required by the Northern Alberta Railways if the company did not have to build the line.

The question has sometimes been raised whether it would not be more economic to serve a mine at Pine Point by an extension and improvement of the Mackenzie Highway rather than by a railroad, at any rate for as long as the production remains relatively low. The Northwest Territories Administration has made a very careful study of the costs of the railway and the highway. This study took into account both those costs which would be met by the shipper and those which would be carried by the government, such as the construction and maintenance of the highway and any contribution which might be made to the cost of the railroad. The conclusion was that, for a volume of traffic in excess of around 75,000 to 100,000 tons a year, it would be more economic to build a railway rather than to make the necessary extension and improvements of the existing highway. Since a traffic of something between 200,000 and 250,000 tons a year is expected at an early stage, including all freight inward and outward, the figures indicate that a railway would be more economic.

A production of 450 tons of concentrates a day from Pine Point would have important benefits to the national economy. In the first place, it would produce a sizeable increase in the Gross National Product. The simplest way to calculate the increase directly provided by the mine would be to take the sales value of the metal which would be produced at Pine Point and deduct from it the cost of all materials, but not labour, used to produce this metal. We have been informed that the company estimates that the value from production from Pine Point, at 450 tons of concentrates a day and at present metal prices, would be \$26,400,000 a year and that the cost of materials used in this production would be \$4,700,000. Hence the increase in G.N.P. contributed directly by the mine would be \$21,700,000. It is true, of course, that if the increased production from Pine Point should depress base metal prices sufficiently to cause other Canadian mines to curtail their production, the whole of the output for Pine Point would not represent an increase in the G.N.P. However, even should prices decline, it can never in the long run be anything but economically good to substitute a lower cost for a higher cost producer.

In addition to the direct contribution of the Pine Point mine to the G.N.P., the production of the material used by the mine would itself represent an increase in G.N.P. to the extent that these materials were not imported or diverted from some other use. There would also be tertiary effects on the G.N.P. from the production of these materials and from the establishment of ancillary industries in connection with Pine Point. It is difficult to estimate just how much all of this would amount to, but it seems likely that a figure of around \$25,000,000 would be a fairly conservative estimate for the total increase in G.N.P. contributed by the production from Pine Point.

Consolidated Mining and Smelting have estimated that, based on present metal prices and tax rates, Pine Point Mines Limited and Consolidated Mining and Smelting together would pay to the federal government approximately \$3,500,000 per annum in additional income taxes and royalties, following the tax exemption period applicable to production

from Pine Point. Since the amortization of the \$50,000,000 cost of a railroad to Great Slave Lake over a period of 50 years at an interest rate of  $3\frac{1}{2}$  per cent per annum would amount to \$2,132,000 a year, and the amortization of \$55,000,000 would amount to \$2,345,000 a year, the direct increase in revenue to the federal government that these figures indicate would be substantially in excess of the cost of building the railroad. There would, of course, be other, and substantial, additional tax revenues as an indirect effect of production at Pine Point.

Another major contribution to the Canadian economy would be the bringing into production of a large mine of more than ordinary economic significance. The opinion has been expressed that this mine, if a railway were provided, would prove to be one of the lowest cost zinc-lead producers in the world. The importance of a mine of this character to the Canadian economy in the event of either a decline in world prices or an increase in the tariffs of the consuming countries scarcely needs to be emphasized.

In summary, therefore, a railroad to Great Slave Lake would be immensely beneficial to the economy of Canada by stimulating exploration and development in the whole District of Mackenzie and by bringing a mine into production which, even during its early stages, would increase the gross national product by \$25,000,000.

While this Royal Commission is concerned with Canada's *economic* prospects, perhaps it is permissible at this time to suggest that the railway could, in the light of other possibilities (not, we hope, prospects) have another great value. It has in recent years become a commonplace that our Arctic frontier is of vital importance for national and continental defence. There is only one route to the central Arctic coast of North America which is not along the exposed sea lanes that stretch along the edges of our continent. That one route is by way of the Mackenzie River. Apart from the possible hazards of direct action against lines of communication in time of war, it is well known that sea transportation around the coast of Alaska, particularly along the northern portion, is exposed to the dangers of the main Arctic pack ice, even when the route is normally open. The naval task force which supplied the DEW line stations this year had considerable difficulty from ice in getting in, and also in getting out. Any eastern approach to the central Arctic coast, by any of the possible straits or passages among the Arctic islands, provides at least as great if not greater hazard from ice. The Mackenzie River route, on the other hand, affords a protected waterway to the very heart of the Arctic coastal region. Transportation both west and east from the mouth of the river—to points on the coast of Alaska as well as to the coast of Canada—runs little risk from ice throughout several weeks each summer. However, the Mackenzie River route cannot be relied on exclusively when one considers that even today's traffic taxes it seriously. The greatest limitation and risks to freight movement are at the southern end of the route—the Athabasca River and the portage on the Slave River from Fort Fitzgerald to Fort Smith. The railway to Great Slave Lake would avoid those constrictions. It would provide an all-year access to the uninterrupted waterway of the Mackenzie River and, by shortening the turn-around period and lengthening the navigation season, would greatly increase its capacity. It would appear that, in view of the national importance of the railway to Great Slave Lake, some thought might well be given to its implications for our national and continental defence.

To return now to the economics of the railway, it must be pointed out that, even if the railway company were relieved of the whole capital cost of the line, the question will still remain of meeting the initial operating deficit as represented by the difference between the required minimum of 350,000 tons of southbound traffic a year and the amount of 157,000 tons a year which the mine will provide after a year or two of operation. I understand that this deficit might amount, in monetary terms, to about \$750,000 a year. In view of the fact that the line from Grimshaw to Great Slave Lake would produce revenue for the lines of the two parent railways in addition to what it would produce for the Northern Alberta Railways, a possibility that seems worthy of consideration is that the C.N.R. and the C.P.R. together might feel able to carry at least part of this deficit. A further possibility may be that the mining company would consider paying an additional premium, over and above the ordinary freight rates, until it was in a position to expand its production above 157,000 tons of concentrates a year. There is every reason to expect that, after an initial period of years, the operating deficit would become a thing of the past. It was once alleged that the C.P.R. would never pay for its axle grease. It does—and a bit more.

The view has sometimes been advanced that railroad construction is appropriately a matter for private enterprise, with perhaps a minor share of government assistance. It is true that the great railroad expansion in Canada was undertaken by private companies—and all praise and credit is due to the men who conceived, planned and carried out these vast, immensely difficult and highly speculative enterprises. However, the railways of our early days, which were the foundation of the Canada of today, would not have been built had they not been seen as national undertakings and given extensive public assistance.

The Report of the Royal Commission on Railways and Transportation in Canada, 1931-32, stated that the total government contribution (federal, provincial and municipal) to Canadian railways since Confederation had amounted, roughly, to \$65,300 a mile. Using the figures given in that Report, another writer has estimated that the total government assistance to the Canadian National Railways was, up to 1931, \$105,000 a mile or, if the unguaranteed securities were deducted, \$76,000 a mile. It is hard to say what the figure of \$65,000 a mile would amount to on the basis of current price levels compared with those at the time that these expenditures were made. However, it would certainly come very close to the estimated cost of the railroad from Grimshaw to Great Slave Lake, which is between \$119,000 and \$131,000 a mile.

A railway to Great Slave Lake will not be just another railway. It is not a railway to a lake, or to open a mine or to serve a community. A railway to Great Slave Lake will be one of the great development railroads of the country. It will not bring population to the Northwest Territories to the same extent that the western railroads brought it to the prairies, but it may well bring in the years ahead a comparable increase in the wealth of Canada. This railway is quite different from most of the branch lines constructed in recent years which were destined to serve one mine, or a group of mines; its purpose is to open up a whole new region. The fact that there happens to be a potential mine of great value at its northern terminus is a piece of great good fortune, for it will enable this railroad to be built without the long wait for reasonable returns which so often has been the lot of a pioneer railroad.



In the 1870's Canada was at the point where a national decision had to be taken that determined whether the west would or would not be opened and developed. The costs were enormous and the risks were staggering, but the decision was taken. The people of the Northwest Territories feel that we are today at the point where a comparable decision has to be taken about our northland. The costs are much less, their magnitude in relation to our national wealth is nothing in comparison with those of the 1870's. Fundamentally, however, the question is the same. I respectfully submit that this Royal Commission should consider whether this is not a case where the nation should undertake the task in order to ensure a greater national development in the future.

## **Development Roads**

The second method of improving transportation facilities in the Northwest Territories to which I wish to direct the attention of the Royal Commission is the provision of development roads. There are no portents in sight which would suggest that a railroad should be built further north than Great Slave Lake for many years to come. A substantial network of main development roads, however, will be highly important because of the severe limitations of the water transportation routes. I have mentioned that these routes are available for a very short season and that they penetrate scarcely at all into many of the most promising mineralized areas of the Northwest Territories.

The type of development road which is of prime importance is one which would lead from a settlement or an established transportation route into a promising mineralized or other resource area. From such a road branches could be built to mines as they are established. These development roads would likely have to be of considerable length—perhaps several hundred miles—and therefore would be fairly costly to build. However, they seem clearly to be essential for extensive resource development. It is the federal government which has the responsibility for developing the natural resources of the Territories. Aside from this, the Territorial government does not have adequate financial resources to build these roads to the extent necessary to stimulate economic development. Once such a road was constructed, of course, it would inevitably serve certain local purposes in addition to its development functions, and therefore it is reasonable that some part of the maintenance should be borne by the Territorial government. However, the capital cost is a matter that is far beyond the capacity of the Territories. It seems important to me, therefore, that the federal government should build development roads into promising areas where active exploration is contemplated without waiting until a mine is ready to come into production.

To give some idea of the roads that may well become desirable during the next 15 to 25 years, two maps are included in this brief. Map No. I shows the transportation systems that exist today and the resource developments which they serve. Map No. II shows the transportation systems that may be envisaged between 1970 and 1980 and the resource developments which they may be expected to serve. Obviously, as conditions develop this forecast will need to be changed, and the priorities which I am about to

suggest may be radically altered. I think, however, that this projection may give a useful picture of the kind of development that, in the light of our knowledge today, seems likely to be desirable in the Northwest Territories in the next two decades.

The first major road that it now appears desirable to build is from the Mackenzie Highway, at Alexandra Falls, westward to the west end of Kakisa Lake and then north to Mills Lake. Above Mills Lake it would cross the Mackenzie by ferry in summer and ice bridge in winter and proceed to the North Arm of Great Slave Lake opposite Rae, and across to Rae by ferry and ice bridge. From Rae it would run southeast to Yellowknife and northwest through the Marian River region up to Hottah Lake, and perhaps as far as Port Radium. The section west from Alexandra Falls has already been started. This portion will pass through a possible oilfield and will serve a shipping point at Mills Lake. If tugs and barges are wintered at Mills Lake they are in a position to start down the river about three or four weeks earlier than is possible with the present services because the ice goes out of the Mackenzie several weeks before it leaves Great Slave Lake. This section of the road, therefore, would permit an important extension of the shipping season for down river points. The extension of the road through to Yellowknife and to Marian River would provide all-year transportation for these two important mining centres. Its further extension northwestwards, as the need arises, to Hottah Lake, and possibly beyond, would provide the same service for other possible mining areas.

Two other roads which seem likely to be desirable are those which would serve the north and the south shores of the East Arm of Great Slave Lake, in both of which regions promising prospects are reported. The road to the north shore would go eastwards from Yellowknife and the road to the south shore would go northeast from Pine Point.

Within the next 15 years or so it seems likely that there will be a substantial community at Pine Point and an important power development near Fort Smith in which case a road connecting these two would be desirable. There is reported, as I have mentioned earlier, to be promising ranchland in the Slave River basin, and this road would probably run eastwards from Pine Point towards the Slave and then up the Valley to Fort Smith. From Fort Smith there is already a portage road to Fitzgerald which runs some miles farther into Wood Buffalo Park. It will be necessary for Park administration purposes to extend this road to the southwest boundary of the Park. It should eventually be joined up with the road already existing from the Mackenzie Highway to Fort Vermilion in the Province of Alberta. Valuable timber limits in Wood Buffalo Park, some of which are already being utilized on a sustained yield basis, would be served by this road. Another road to serve a forested and potential mixed farming region could run from Fort Nelson, through Nelson Forks and Fort Liard, down the valley of the Liard River to Fort Simpson.

In the eastern portion of the mainland, it seems likely that some form of transportation will become necessary to serve the highly favourable mineralized belt which runs diagonally from Lake Athabasca to Rankin Inlet on Hudson Bay. A road has therefore been drawn on the map from Uranium City to Ferguson Lake and then southeast to Eskimo Point. This line, even more than the other projected roads, is not intended to

show the probable route but merely to indicate that some form of surface transportation in this area might be desirable. It is also a possibility that this road could have a connecting link to railhead at Lynn Lake, Manitoba.

Two short roads might become desirable in the northern portion of the Territories. One would run from the copper deposits at the Dismal Lakes to Coppermine, and would provide an outlet from these deposits to the sea. The other would be an extension to Fort McPherson of the road from Dawson, Yukon Territory, to the Eagle Plain oilfields. This would provide a valuable link between the Mackenzie Valley and the northern Yukon plateau.

### **Air Routes to the Arctic**

Defence activities along the Arctic Coast and in the archipelago will require air supply routes from the south, and also east-west connections. The probable routes, as they may develop over the next few years, are shown on Map No. III. It is highly desirable that these lines should be operated as scheduled services by commercial common carriers and not as private supply routes by the defence services or by whatever other organization may be manning the stations. If the air routes are available for all those who have need of them they will greatly facilitate the administration, the mineral exploration and the general development of the northern part of the Northwest Territories. They will assist with health and medical services. They will also do much to provide ready communications for the people there; to permit frequent mail services; and, in general, to reduce the sense of isolation which is now a burden on the people living and working on the edge of our continent. In an area where costs are high and services scarce, it would be a grave mistake not to establish them on a basis that will be of general advantage, rather than on a basis that will serve a single purpose and leave the rest unprovided for.



## CONCLUSION

This Brief has surveyed the potential resources of the Northwest Territories with a view to discerning how they are likely to contribute to the growth of the Canadian economy over the next 15 to 25 years, and has discussed ways and means by which this contribution could be expedited and enhanced. In doing this, attention has been largely concentrated on the provision of better and cheaper transportation. There are, of course, many other things which would have a beneficial influence on economic development. One of these is the provision of satisfactory health and education services. Mention has been made of the importance of these services for the Indian and Eskimo population, but it is equally important to provide them for those people who come from other parts of Canada to make the north their home. The absence or inadequacy of such services can be a hindrance and deterrent to settlement, and hence to economic development. For this reason, the administration of the Northwest Territories is particularly pleased that the Northern Health Service has been established by the federal government on a basis that would permit it to meet, at territorial expense, the needs of part of the non-Indian and non-Eskimo population. The territorial government is also pleased that a co-operative federal-territorial school program is moving forward.

There are other measures that could have a similar indirect effect on economic development. For example, a sense of isolation from the world and from the rest of Canada derives from the fact that there is only one newspaper in the Northwest Territories and the cost of getting papers from "outside" by air is high—when it can be done at all. This isolation can be a further deterrent to population growth. Much could be done to remove it by assistance in the setting up of local radio stations and in conveying programs to them, and by the establishment of a "Northern Service" by the Canadian Broadcasting Corporation to direct radio programs to those parts of the Territories which cannot be served by local stations.

The Royal Commission might also wish to direct its attention to the effect of present federal tax policies upon the economic development of the Northwest Territories. In addition to the burden of high operating costs on existing mines there are important other problems inherent in bringing a new mine into production in northern Canada. Most of these involve not only higher costs but a substantially increased time until the production stage can be reached. They derive, in general, from the short construction season and great transportation problems. Their effect is to make the three year period of tax exemption for new mines in the north of much less benefit than it is in the southern parts of Canada closer to established transportation systems. The Commission might therefore wish to consider whether, in the interest of the development of our northern areas, there would not be ground for some provision by which new mines in northern Canada might be allowed a longer period of tax exemption which would give them, in practice, a more genuinely equal opportunity than now exists with companies operating further south. This is a matter of great importance to our neighbour, the Yukon Territory, and I understand that the Commissioner of that Territory is discussing it in his Brief. I do not wish to take the time of the Commissioners by repeating his arguments, I wish only to state that this situation applies with equal force to the Northwest Territories.

Above all else, however, the matter which I suggest for the most serious attention of the Royal Commission is the problem of transportation. The delays and difficulties it has imposed and, most of all, the costs it has created have been and are the single greatest deterrent to the economic development of the Northwest Territories. If better facilities can be provided, if more certain transportation can be made available, and if costs can be reduced to reasonable levels, the stimulus to economic development will be enormous. In any programme toward this end, the most important single factor, I submit, is the railway to Great Slave Lake. Next, in importance, I would suggest, is the provision of adequate development roads.

In submitting this Brief on behalf of the Administration of the Northwest Territories I wish to add that it has been the subject of careful consideration by the Council of the Northwest Territories. The views advanced here are in accordance with those that the members of the Council wished to have placed before this Royal Commission. In submitting them, both the members of the Council and we of the Administration have the sense that we are dealing not merely with the future of the Northwest Territories but with the progress of Canada as a whole. In the first seventy-five years after Confederation a prime object of national policy was the linking together of our different regions from the Atlantic to the Pacific. Canada has now, as a nation, become increasingly conscious of its third dimension. This country is nearly as vast from north to south as it is from east to west. As we in Canada develop our northern areas and bind them, by our daily comings and goings, into the more settled areas of the south, I submit that we shall not only be insuring the realization of new wealth in a not very distant tomorrow. We shall also be writing the second of the major chapters in our development as a nation.

## NORTHWEST TERRITORIES

PROJECTED SEA AND SCHEDULED AIR ROUTES

1970-1980

Air Routes

Sea Routes

Territorial Boundaries

Scale in Miles

100 0 100 200







## APPENDICES





## **Appendix A**

### **Geological Nature of the Northwest Territories and the Prospects for Mineral Development**

By J. M. HARRISON and R. J. W. DOUGLAS  
GEOLOGICAL SURVEY OF CANADA

The Northwest Territories can be divided into three main geological regions. The largest region, and the most important from the viewpoint of present mineral production, is the mainland Canadian Shield. The Shield extends east of a line that runs from Fort Smith roughly north-northwest to Darnley Bay and therefore forms the bedrock of more than half of District of Mackenzie as well as practically all of District of Keewatin. The next largest area is occupied by the Arctic Islands where geological exploration has just nicely started, and the third region is the Interior Plains and Cordilleran region that lies west of the Canadian Shield. It is the source of some production of oil and coal and contains at least one large deposit of lead and zinc.

The Canadian Shield and the Arctic Islands are described by J. M. Harrison; the possibilities for Interior Plains and Cordillera are considered by R. J. W. Douglas, except that the lead-zinc deposits are described by Harrison.

#### **Mainland Canadian Shield**

This large region is one of low relief, although it ranges to 1,000 feet or more in some places, and rock outcrops alternate with lakes, swamps, and sand plains. Most of the region is north of tree line and the climate is sub-arctic to arctic.

Although mineral localities have been known for centuries, the mining industry got under way only in 1932 at Great Bear Lake following the discovery of pitchblende there in 1930. This mine was of great importance to Canada, but the real impetus to mining came with the discovery of gold on the west side of Yellowknife Bay in 1935. From this discovery grew the mines of the Yellowknife district, with a yearly production greater than 10 million dollars, and the town itself. Prospecting and developing virtually ceased for 5 years as a result of World War II so that, in effect, development has taken 15 years. What will happen in the next 15 years depends on many factors, but officials in the mining industry obviously think the prognosis is good because 1955 looks like a record year for staking claims in the N.W.T.

Anything that is done to reduce costs of transportation will assist the discovery and exploitation of new mines, and will add to the life of those already operating. For example, the cut-off between ore and waste at Giant Yellowknife Gold Mine is \$14.00, or 0.4 oz. gold per ton, and the average grade mined in 1954 was nearly \$22.00, whereas at Kerr Addison (in Northern Ontario) the ore mined averaged a little more than \$7.00. Not all of this difference is due to the remoteness of Giant Yellowknife, but distance of transportation is by far the biggest single factor. It is apparent that all production from the N.W.T. comes from the region that is relatively accessible along the main water route to the north. Nevertheless, the cheaper materials are landed along this route, the greater the radius of effective prospecting, and the better are hopes for eventual mines. A producing camp in a new area also means increased facilities for prospecting from that camp.

Helicopter operations by the Geological Survey in 1952, 1954, and 1955 have disclosed about 15,000 square miles of territory underlain by rocks worth prospecting for base and precious metals. These rocks had hitherto been unknown or incompletely mapped and large areas have never been prospected. Altogether, more than 20,000 square miles of the mainland Canadian Shield in the Northwest Territories can be considered well worth prospecting and only a small percentage has been intensively prospected. It should, nevertheless, be kept in mind that intensive prospecting of an area does not necessarily mean further prospecting is needless. Noranda was mined for 20 years before Quemont was found next door; Flin Flon was discovered in 1915, but nearby Birch Lake was disclosed in 1951; Bathurst iron mine was worked in 1917 and the base metals were found only a few tens of feet away in 1952.

## **Gold Deposits**

Except for Eldorado Mining and Refining on Great Bear Lake, all production from Canadian Shield in the N.W.T. is from gold mines. If the price of gold is raised, or the costs of production are lowered, gold mining in the Yellowknife area will boom. If the prices and costs remain stable, little improvement can be expected because few mines have material with a grade high enough to stand the strain. Several deposits are known that are nearly rich enough to mine at present prices and an improvement in the prices would mean that mines would come into production over a large area north and east of Yellowknife. It would also stimulate prospecting through the large areas of "greenstones" mapped by helicopter operations in 1952, 1954, and 1955, especially areas within 200 miles of Great Slave Lake, Uranium City, and Churchill. It is reasonable to expect that few mines would be found in these outlying areas and, by analogy with other regions, new mines would be found in the productive region near Yellowknife.

## **Uranium Deposits**

The Eldorado mine on Great Bear Lake was the first producer of uranium and radium in Canada. For many years the region between Great Bear Lake and the north end of Marian Lake, and east from the Palaeozoic contact for about 50 miles, has been known

as an area favourable for uranium. The discovery of uranium at Rayrock in the past year is of major significance because the deposit appears rich enough and big enough to come into production without special contracts. Other deposits in this area also appear to have similar promise. Occurrences of other minerals in the area are sparse and none seems to have economic significance.

Many claims have been staked for uranium in the MacInnes Lake area, about Latitude  $61^{\circ} 20'$  and Longitude  $110^{\circ} 10'$ , and extending northward to and beyond Nonacho Lake. Assays greater than 0.5%  $U_3O_8$  have been reported from some showings, and the area, therefore, is promising.

So far as known, no finds of uranium have been reported from Keewatin, probably because lack of maps, high costs, and general remoteness have discouraged prospecting. However, maps will be available for most of Keewatin and eastern Mackenzie south of  $66^{\circ}$  for the prospecting season of 1956, and increased prospecting can be expected for uranium and other metals.

### **Copper-Nickel Deposits**

Copper deposits have been known for many years, especially in the Coppermine district and the east arm of Great Slave Lake. None has so far been shown to be exploitable, chiefly because of the remoteness, but prospecting and drilling for copper has continued through the years. With the current high price for copper, and the apparent opinion that the price will remain relatively high, prospecting of the Coppermine and Great Slave occurrences has been accelerated. Copper deposits are known to occur from Fort Reliance at least as far south as Latitude  $61^{\circ} 00'$ , and overlap on the MacInnes Lake uranium area. These deposits are rich in copper, but small in size, so it is possible only to state that the chances of finding a commercial deposit are reasonable. Farther east, in Keewatin, several copper showings and some copper-nickel deposits have been found, but all too low in grade or too small to be mined under present conditions. This region has not been prospected thoroughly by any means and the fact that so many showings were found by such relatively little prospecting effort suggests that the chances of finding commercial bodies are reasonable. The nickel-copper deposit at Rankin Inlet may yet be proven a commercial proposition and, if so, a new base of operations will become available for prospecting teams, thus reducing costs considerably.

### **Lead-Zinc Deposits**

A few small deposits of lead-zinc material are known in the Canadian Shield but only one, the Indian Mountain Lake deposit about 120 miles east of Yellowknife appears to be commercially attractive. The fact that such deposits are known, however, suggests that the area merits more attention from prospectors for these minerals, especially near O'Connor Lake where small high grade deposits occur. Nevertheless, the best chances seem to be in the Palaeozoic limestones.

## **Industrial Minerals**

Numerous pegmatite dykes are known in the Yellowknife region and many have been examined as potential sources of lithium, beryl, tantalum, and columbium. In 1955, several were re-staked and are being re-examined. These deposits are potentially important, but pegmatite deposits elsewhere in Canada are more advantageously located. Possibly, these in the Northwest Territories will become more important in 10 years or so.

## **Arctic Islands**

In 1955 the Arctic Islands (District of Franklin) were largely covered by reconnaissance Geological Survey teams supported by helicopters. The results of their investigations have not yet been collated so that it is not possible to give a complete appraisal. However, 7 seams of anthracite coal more than 4 feet thick were found on Axel Heiberg Island as well as numerous seams of lesser rank coal in other localities. Vast quantities of gypsum were discovered and strong support was obtained for the possibilities of petroleum. Occurrences of iron (magnetite) have been known for many years on southern Baffin Island, which is formed mainly of Precambrian rocks, and rocks suitable for occurrences of copper are known on Victoria Island. Although this may seem a remote and unpromising region, nevertheless two commercial organizations are known to have investigated areas in the District of Franklin in 1955.

## **Interior Plains and Cordilleran Region**

The western part of the District of Mackenzie, Northwest Territories, embraces the northern part of the Interior Plains of western Canada and, in the southwest, the Mackenzie and Franklin Mountains of the Rocky Mountain Cordillera. The Interior Plains are a lowland studded with numerous small lakes and muskegs with ridges and hills of low relief. In the southwest the outer ranges of the Cordillera, the Franklin Mountains, rise abruptly above the Plains. They are separated from the Mackenzie Mountains by a narrow lowland, the Mackenzie Plain, through which the Mackenzie River flows for part of its course.

The Interior Plains are underlain by flat-lying or gently dipping sedimentary rocks of Palaeozoic, Mesozoic, and Tertiary ages which unconformably overlie the Precambrian rocks of the Canadian Shield. The Franklin Mountains, rising to elevations of about 5,000 feet, form a series of disconnected linear ranges, arcuate in plan, convex to the northeast. Within them, Palaeozoic rocks are exposed, in part repeated by faults or folded into discontinuous and irregularly trending anticlines and synclines. In the lowland of the Mackenzie Plain, Cretaceous and Tertiary strata, flat-lying or warped into gentle folds, are preserved. In the Mackenzie Mountains Palaeozoic rocks are brought to the surface in broad open folds, in part asymmetric and tightly compressed. The eastern edge of the Mackenzie Mountains is arcuate, similar to that of the Franklin Mountains. Parts



of these mountains are deeply dissected plateaux, much is rugged, and elevations exceed 5,000 feet. The Mackenzie Mountains are bordered in the southwest by the Selwyn Mountains which lie mainly in the Yukon Territory. Richardson Mountains along the border between Yukon and Northwest Territories, are about 1,500 feet in elevation. The strata, mainly Mesozoic in age, are folded into asymmetric, discontinuous structures trending nearly north-south and are, in part, faulted.

The nature of the sedimentary rocks of the western District of Mackenzie is well known only in the southern part of the Interior Plains and along Mackenzie River and bordering ranges of the Franklin and Mackenzie Mountains. Much of the bedrock of the Interior Plains is obscured by glacial drift. The oldest rocks are the Silurian Fitzgerald formation of dolomite, gypsum and anhydrite, and the underlying Ordovician beds of red limestone, dolomite, sandstone, salt and gypsum. These rocks total about 800 feet in thickness. In the Mackenzie and Franklin Mountains equivalent and older beds reach 4,000 feet in thickness and consist mainly of limestone and shale with some quartzite, argillite, dolomite breccia, gypsum and anhydrite. Middle Devonian strata, 900 feet thick on the Interior Plains, unconformably overlie the Silurian. They are interbedded shales and limestones, in part bituminous, with porous, vuggy, bituminous dolomites from which oil seepages and sulphur water springs are known. These latter beds of the Presqu'île formation are considered a likely reservoir for petroleum and natural gas and are also the host rocks of the lead and zinc mineralization at Pine Point. In the Mackenzie and Franklin Mountains equivalent beds are 300 to 700 feet of massive-bedded limestones and shales. The Upper Devonian of the Interior Plains, 900 feet in thickness are grey and green shales of the Simpson formation and dolomites, limestone and shales of the overlying Hay River formation. These beds grade laterally into the Fort Creek and Imperial formations 3,200 feet thick, of the Mackenzie lowland. The former consists of dark bituminous shales with disconnected masses of reef limestone, and the latter of sandstones and shales, in part of non-marine origin. The reef limestone of the Fort Creek is the oil reservoir at the Norman Wells field. Other similar reefs may ultimately be found. Rocks of Cretaceous age are present mainly in the Mackenzie lowland and in the northern part of the Interior Plains. They consist of soft shales and sandstones, in part coal-bearing, about 5,000 feet thick, which unconformably overlie the older strata. Coal from these beds is mined at present at Moose River north of Aklavik. Unconsolidated sands and clays, with seams of lignite, Tertiary in age, unconformably overlie the Cretaceous. Their distribution is known only along the middle and lower parts of the Mackenzie River where thicknesses of 600 to 1,200 feet are present.

Oil is produced at the Norman Wells field at approximately 350,000 barrels per annum. This is refined locally and the products shipped to points along the Mackenzie River and mining districts on Great Bear and Great Slave Lakes. Reserves of the field of 64 wells are estimated at 36 to 60 million barrels, of which 4.3 million barrels have been produced to date. Recent drilling in the vicinity of Rabbit Lake west of Hay River has resulted in the discovery of natural gas, the volume and extent of which has not yet been determined. Coal of bituminous rank is mined at Moose River, 200 tons being shipped annually to the town of Aklavik for use as domestic fuel.

Future development of the non-metallic minerals, coal, petroleum, natural gas, salt and gypsum, known to be present in the Northwest Territories, is dependent almost entirely on the extent of future exploration for oil. Geological features of the western part of the District of Mackenzie are such that it may be reasonably supposed that continued drilling will result in the discovery of additional oil fields. The sedimentary rocks are thick in parts of the region, and known locally to be bituminous and productive. Fold structures are prevalent throughout much of the region, and stratigraphic traps may be expected from the regional relationships of the sands and carbonates to the impervious shales. The development of sufficient oil reserves should see the building of pipe lines into the Yukon and to the sea, and southward into Alberta. Natural gas, which may be expected to be developed in considerable volume during the course of drilling for oil may, however, not be utilized to the fullest owing to limited markets within foreseeable economic reach. Local mining districts may be served by nearby gas discoveries. Also incidental to the drilling for oil additional data on the thickness, distribution and character of the evaporites which underlie much of the region will be obtained. However, unless the rarer salts are discovered, it is unlikely that they will be extracted in competition with established production from more favourably located salt basins. Known coal deposits could be developed to meet local demands as required.

Lead and zinc deposits have been known since 1898 at Pine Point, near the south shore of Great Slave Lake, in Palaeozoic rocks. In 1948 new exploration of these deposits was begun on the basis of an hypothesis that the Macdonald fault in Precambrian rocks might be the controlling structure. As a result of this latest work, the company has stated that in excess of sixty million tons of ore have been indicated. Other similar deposits may be found in these rocks, but their discovery depends on different prospecting methods.

Geological Survey of Canada,  
18 October 1955.

## Appendix B

### MINERAL PRODUCTION (EXCLUDING RADIUM AND URANIUM) IN THE NORTHWEST TERRITORIES

1939—1954

Year	Total Value <sup>1</sup>	Gold		Crude Petroleum	
	\$	Fine oz.	\$	Bbbs.	\$
1939	2,127,000	51,900	1,876,000	20,200	50,000
1940	2,184,000	55,100	2,124,000	18,600	37,000
1941	2,935,000	74,400	2,865,000	23,700	47,000
1942	3,976,000	99,400	3,827,000	75,800	108,000
1943	2,680,000	59,000	2,273,000	293,800	400,000
1944	1,440,000	20,800	780,000	1,223,700	633,000
1945	471,000	8,700	333,000	345,200	136,000
1946	1,040,000	23,400	861,000	177,300	173,000
1947	2,731,000	62,500	2,188,000	227,500	500,000
1948	4,267,000	101,600	3,557,000	350,500	677,000
1949	6,802,000	177,500	6,390,000	155,500	353,000
1950	8,051,000	200,700	7,635,000	186,700	353,000
1951	8,289,000	212,200	7,820,000	227,400	400,000
1952	8,945,000	247,600	8,485,000	314,200	379,000
1953	10,033,000	289,900	9,979,000	316,700	257,000
1954	10,922,000	308,600	10,513,000	369,900	345,000

<sup>1</sup> Includes small amount of copper, silver and natural gas.  
Source: Dominion Bureau of Statistics.

## Appendix C

### GREAT SLAVE LAKE FISHERY

(Whitefish and Lake Trout)

1949-50—1955

Year	Summer Season		Winter Season		Total	
	Catch ('000 lbs.)	Per cent of quota caught	Catch ('000 lbs.)	Per cent of quota caught	Catch ('000 lbs.)	Per cent of quota caught
		%		%		%
1949-50	4,642	93	3,987	100	8,629	96
1950-51	3,947	79	3,690	92	7,637	85
1951-52	4,130	78	2,523	68	6,653	74
1952-53	4,091	77	2,932	79	7,022	78
1953-54	3,422	60	2,280	69	5,701	63
1954-55	4,142	73	2,485	75	6,627	74
1955-56	4,845	85	—	—	—	—

NOTE. The fishery started in 1945-46 when the annual quota was two million pounds dressed weight and the total catch was 1,205,041 lbs. dressed weight. In 1946-47 this quota was raised to 3.5 million lbs. dressed weight and further increased in 1948-49 to 6.45 million lbs. dressed weight. (Factors of conversion from dressed to round weight are, whitefish 1.18 and lake trout 1.20.)

In 1949-50 the quota was raised to its present level of 9 million pounds round weight, 5 million lbs. for the summer season and 4 million lbs. for the winter season. It was changed in 1951-52 to 5.3 million lbs. for the summer season and to 3.7 million lbs. for the winter season. In 1953-54, the summer quota was raised to its present level of 5.7 million lbs. and the winter quota lowered to 3.3 million lbs.

SOURCE: Department of Fisheries.

## Appendix D

### FUR TRAPPING, NORTHWEST TERRITORIES

TABLE I

#### Total Fur Production

1937-38—1953-54

Year ended June 30	Number of Pelts	Total Value of Pelts	
		(current dollars)	(constant dollars) 1937-38 = 100
		\$	\$
1937-38	523,000	1,312,000	1,312,000
1938-39	515,000	1,275,000	1,272,000
1939-40	530,000	1,235,000	1,214,000
1940-41	448,000	2,301,000	2,154,000
1941-42	445,000	2,841,000	2,528,000
1942-43	385,000	3,165,000	2,726,000
1943-44	298,000	2,199,000	1,875,000
1944-45	259,000	1,744,000	1,478,000
1945-46	556,000	2,750,000	2,286,000
1946-47	488,000	1,659,000	1,295,000
1947-48	482,000	1,872,000	1,306,000
1948-49	922,000	1,535,000	988,000
1949-50	561,000	910,000	568,000
1950-51	644,000	2,038,000	1,198,000
1951-52	696,000	1,448,000	798,000
1952-53	389,000	877,000	479,000
1953-54	419,000	757,000	414,000

SOURCE: Dominion Bureau of Statistics.

### FUR TRAPPING, NORTHWEST TERRITORIES

TABLE II

#### Muskrat Production

1937-38—1953-54

Year ended June 30	Number of Pelts	Total Value of Pelts	Average Value per Pelt	Per cent of Total Value Fur Production, N.W.T.
				%
		\$	\$	
1937-38	422,000	249,000	0.59	19
1938-39	429,000	339,000	0.79	27
1939-40	440,000	378,000	0.86	31
1940-41	339,000	498,000	1.47	22
1941-42	343,000	675,000	1.97	24
1942-43	277,000	609,000	2.20	19
1943-44	231,000	435,000	1.88	20
1944-45	216,000	485,000	2.25	28
1945-46	449,000	1,235,000	2.75	45
1946-47	337,000	505,000	1.50	30
1947-48	396,000	865,000	2.30	46
1948-49	724,000	869,000	1.20	57
1949-50	474,000	569,000	1.20	63
1950-51	495,000	994,000	2.01	49
1951-52	517,000	574,000	1.11	40
1952-53	250,000	240,000	0.96	27
1953-54	322,000	216,000	0.67	28

SOURCE: Dominion Bureau of Statistics.



## Appendix D

### FUR TRAPPING, NORTHWEST TERRITORIES

TABLE III

#### White Fox Production

1937-38—1953-54

Year ended June 30	Number of Pelts	Total Value of Pelts	Average Value per Pelt	Per cent of Total Value Fur Production, N.W.T.
		\$	\$	%
1937-38	49,000	570,000	11.57	43
1938-39	43,000	477,000	11.12	37
1939-40	30,000	251,000	8.24	20
1940-41	46,000	850,000	18.27	37
1941-42	51,000	1,318,000	25.85	46
1942-43	61,000	1,695,000	28.00	54
1943-44	28,000	913,000	32.25	42
1944-45	17,000	604,000	36.00	35
1945-46	21,000	448,000	21.50	16
1946-47	58,000	780,000	13.50	47
1947-48	53,000	585,000	11.00	31
1948-49	31,000	276,000	8.80	18
1949-50	10,000	65,000	6.50	7
1950-51	40,000	456,000	11.47	22
1951-52	50,000	388,000	7.79	27
1952-53	36,000	306,000	8.38	35
1953-54	27,000	280,000	10.29	37

SOURCE: Dominion Bureau of Statistics.

## Appendix E

### POPULATION OF THE NORTHWEST TERRITORIES, 1911—1951

Year	Total			
	Total	Whites	Indians	Eskimos
1911	6,507	1,650	4,857	
1921	8,143	1,028	3,873	3,242
1931	9,316	1,004	3,689	4,623
1941	12,028	2,290	4,334	5,404
1951	16,004	5,321 <sup>1</sup>	3,838	6,822

Mackenzie District				Keewatin District				Franklin District			
Total	Whites	Indians	Eskimos	Total	Whites	Indians	Eskimos	Total	Whites	Indians	Eskimos
4,823	not available			1,178	not available			506	not available		
6,946	"			992	"			205	"		
5,321	867	3,672	782	1,919	73	17	1,829	2,076	64	—	2,012
7,294	2,119	4,322	853	1,766	84	12	1,670	2,968	87	—	2,881
10,279	4,915	3,838	1,503	2,301	176	—	2,125	3,424	230	—	3,194

<sup>1</sup>In addition there were 23 of Asiatic origins.

SOURCE: Dominion Bureau of Statistics.

## Appendix F

### COMPARATIVE CLIMATIC DATA Average Daily Mean Temperatures in Selected Months

Location	Years of Observation	January	July	November- March	June- August
(Degrees Fahrenheit)					
<b>N.W.T.</b>					
Yellowknife.....	10	-18	60	- 8	57
Fort Smith.....	30	-13	61	- 3	58
Port Radium.....	11	-15	54	- 7	51
Aklavik.....	22	-18	56	-12	52
Chesterfield.....	29	-26	48	-17	44
Frobisher.....	10	-18	46	- 6	43
<b>Yukon</b>					
Whitehorse.....	10	5	56	10	55
Mayo Landing.....	26	-11	58	- 2	56
<b>Quebec</b>					
Chibougamau.....	14	- 3	61	8	58
Knob Lake.....	5	-13	55	1	52
<b>Ontario</b>					
Porquis Junction.....	12	1	64	11	61
Sudbury.....	16	10	66	18	64
<b>Manitoba</b>					
Winnipeg.....	66	- 3	67	9	64
Flin Flon.....	23	- 7	66	4	62
<b>Saskatchewan</b>					
Saskatoon.....	38	- 1	65	10	62
<b>Alberta</b>					
Edmonton.....	56	6	62	16	60

SOURCE: Meteorological Division, Department of Transport.







